MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

You are in a train traveling on a norizontal	track and notice that a piece of luggage starts to slide directly
toward the front of the train. From this obs	ervation, you can conclude that this train is
A) slowing down.	B) speeding up and changing direction.
C) changing direction.	D) slowing down and changing direction.

- 2) A 1200-kg car is pulling a 500-kg trailer along level ground. Friction of the road on the trailer is negligible. The car accelerates with an acceleration of 1.3 m/s². What is the force exerted by the car on the trailer? A) 650 N B) 600 N C) 750 N D) 700 N
- 3) A crate is sliding down an inclined ramp at a constant speed of 0.55 m/s. The vector sum of all the forces acting on this crate must point

A) perpendicular to the ramp.	B) down the ramp.
C) up the ramp.	D) None of the above choices is correct.

4) Bill and his daughter Susan are both standing on identical skateboards (with really good frictionless ball bearings), initially at rest. Bill weighs three times as much as Susan. Bill pushes horizontally on Susan's back, causing Susan to start moving away from Bill. Just after Bill stops pushing,

- A) Susan and Bill are moving away from each other, and Susan's speed is one-third that of Bill.
- B) Susan is moving away from Bill, and Bill is stationary.
- C) Susan and Bill are moving away from each other, with equal speeds.
- D) Susan and Bill are moving away from each other, and Susan's speed is three times that of Bill.
- 5) A block is on a frictionless table, on earth. The block accelerates at 5.3 m/s² when a 10 N horizontal force is applied to it. The block and table are set up on the Moon where the acceleration due to gravity is 1.62 m/s². A horizontal force of 5 N is now applied to the block when it is on the Moon. The acceleration imparted to the block by this force is closest to

A) 3.2 m/s ² .	B) 3.4 m/s^2 .	C) 2.9 m/s ² .	D) 2.7 m/s ² .

6) A 45.0-kg person steps on a scale in an elevator. The scale reads 460 N. What is the magnitude of the acceleration of the elevator?

A) 0.206 m/s^2

- $/s^2$ B) 46.9 m/s² C) 4.91 m/s² D) 0.422 m/s²
- 7) You push on box G that is next to box H, causing both boxes to slide along the floor, as shown in the figure. The reaction force to your push is



A) the push of box G against you. C) the push of box H on box G. B) the acceleration of box G. D) the push of box G on box H.

8) A small car and a large SUV are can produce a maximum acceler drivers push their accelerators to after a few seconds?	at a stoplight. Th rating force equal o the floor at the s	e car has a mass equal to to twice that of the car. ame time. Which vehicl	o half that of the SUV, and the SUV When the light turns green, both e pulls ahead of the other vehicle
A) It is a tie.	B) The c	ar pulls ahead.	C) The SUV pulls ahead.
9) A person is using a rope to lowe magnitude of the force exerted b A) 5.0 N	er a 5.0–N bucket i by the rope on the B) 2.0 N	into a well with a consta bucket? C) 10 N	nt speed of 2.0 m/s. What is the D) 49 N
10) A 75–N box rests on a perfectly s	smooth horizonta	l surface. The minimum	force need to start the box moving
is			
A) 7.5 N.		B) 75 N.	
C) 750 N.		D) any horizo	ontal force greater than zero.
 11) A person who normally weighs 9.8 m/s. If this person is standin A) less than 700 N B) 700 N C) more than 700 N D) It could be more or less the 	700 N is riding in Ig on a bathroom an 700 N, depend	a rather swift elevator scale inside the elevator	that is moving at a constant speed of , what would the scale read? rator is going up or down.
12) A horse pulls a cart with force F magnitude of the force that the c	. As a result of th cart exerts on the l	is force the cart accelera	ites with constant acceleration. The
A) is zero newtons.		B) greater tha	an the magnitude of \vec{F} .
C) equal to the magnitude of	→ F .	D) less than t	he magnitude of \mathbf{F} .
13) An object of weight W is in freefa exerts on Earth isA) less than W.B) cannot be determined wit	all close to the sur hout knowing the	face of Earth. The magr	itude of the force that the object object and the earth.

- C) equal to *W*.
- D) greater than *W*.
- 14) An object of mass *m* rests on a flat table. The earth pulls on this object with a force of magnitude *mg*. What is the reaction force to this pull?
 - A) The table pushing up on the object with force *mg*.
 - B) The object pulling upward on the Earth with force *mg*.
 - C) The object pushing down on the table with force *mg*.
 - D) The table pulling upward on the Earth with force *mg*.
- 15) An object is moving with constant non-zero velocity. Which of the following statements about it *must* be true?
 - A) A constant force is being applied to it in the direction of motion.
 - B) Its acceleration is in the same direction as it velocity.
 - C) The net force on the object is zero.
 - D) A constant force is being applied to it perpendicular to the direction of motion.

- 16) A 20-ton truck collides with a 1500-lb car. Which of the following statements must be true?
 - A) The car did not slow down during the collision, but the truck did.
 - B) During the collision, the force on the truck is equal to the force on the car.
 - C) During the collision, the force on the truck is greater then the force on the car.
 - D) During the collision, the force on the truck is smaller than the force on the car.
- 17) A truck is using a hook to tow a car whose mass is one quarter that of the truck. If the force exerted by the truck on the car is 6000 N, then the force exerted by the car on the truck is
 - A) 6000 N. B) 1500 N. C) 24000 N. D) 12000 N.
- 18) A golf club hits a golf ball with a force of 2400 N, sending the ball into the air. The force exerted on the club by the ball must be less than 2400 N or else the ball would not have moved forward.
 - A) True
 - B) False
 - C) The answer depends on whether the golfer followed through with the swing.
- 19) Two blocks, A and B, are being pulled to the right along a horizontal surface by a horizontal 100–N pull, as shown in the figure. Both of them are moving together at a constant velocity of 2.0 m/s to the right, and both weigh the same.



Which of the figures below shows a correct free-body diagram of the horizontal forces acting on the upper block, A?



20) A push of magnitude *P* acts on a box of weight *W* as shown in the figure. The push is directed at an angle θ below the horizontal, and the box remains a rest. The box rests on a horizontal surface that has some friction with the box. The normal force on the box due to the floor is equal to



21) Two objects of unequal masses, M and m (M > m), are connected by a very light cord passing over an ideal pulley of negligible mass. When released, the system accelerates, and friction is negligible.



Which one of the following free-body diagrams most realistically represents the forces acting on the two objects in the moving system?



22) Two boxes are connected to each other by a string as shown in the figure. The 10–N box slides without friction on the horizontal table surface. The pulley is ideal and the string has negligible mass. What is true about the tension *T* in the string?



C) T = 60 N

D) T = 30 N

23) Two boxes, A and B, are connected by a horizontal string S on a horizontal floor. A very light wire pulls horizontally on box B, as shown in the figure, with a force of 100 N. The reaction force to this pull is

Δ	S	р	
A		Б	

A) the force that bo C) the pull that stri	x A exerts on box B. ng S exerts on box A.	on box B.B) the pull of box B on the wiron box A.D) the pull that box B exerts on	
24) A 200–N sled of slides magnitude of the force	down a frictionless hillside t that the surface of the hill e	that rises at 37° above the h xerts on the sled?	orizontal. What is the
A) 120 N	B) 200 N	C) 160 N	D) 150 N
25) A 200–N sled of slides magnitude of the force	down a frictionless hillside t that the hill exerts on the sle	that rises at 37° above the h ed parallel to the surface of	orizontal. What is the the hill?
A) 120 N	B) 200 N	C) 0 N	D) 160 N
	1 1 1		

- 26) Two objects have masses *m* and 5*m*, respectively. They both are placed side by side on a frictionless inclined ramp and allowed to slide down from rest without any air resistance. Which one of the following statements about these objects is correct?
 - A) It takes the lighter object 5 times longer to reach the bottom of the ramp than the heavier.
 - B) It takes the lighter object 10 times longer to reach the bottom of the ramp than the heavier.
 - C) It takes the heavier object 10 times longer to reach the bottom of the ramp than the lighter.
 - D) The two objects reach the bottom of the ramp at exactly the same time.
- 27) A block of mass *m* sits at rest on a rough inclined ramp that makes an angle θ with the horizontal. What must be true about normal force *F* on the block due to the ramp?

		*	
A) $F > mg \cos \theta$	$\mathbf{B}) F > mg \sin \theta$	C) $F = mg\sin\theta$	D) $F = mg \cos \theta$

- 28) A 400-kg box is lifted vertically upward with constant velocity by means of two cables pulling at 40.0° on either side of the vertical direction. What is the tension in each cable? A) 231 N B) 800 N C) 3920 N D) 2560 N
- 29) The figure shows a 100-kg block being released from rest from a height of 1.0 m. It then takes 0.53 s for it to reach the floor. What is the mass *m* of the block on the left? There is no friction or mass in the pulley, and the connecting rope is very light.



B) 16 kg

C) 11 kg

D) 13 kg

30) A 15-kg block is on a frictionless ramp that is inclined at 20° above the horizontal. It is connected by a very light string over an ideal pulley at the top edge of the ramp to a hanging 19-kg block, as shown in the figure. The string pulls on the 15-kg block parallel to the surface of the ramp. Find the magnitude of the acceleration of the 19-kg block after the system is gently released?



31) You push downward on a trunk at an angle 25° below the horizontal with a force of 750 N. If the trunk is on a flat surface and the coefficient of static friction between the surface and the trunk is 0.61, what is the most massive trunk you will be able to move?

A)) 112 kg	B) 81 kg	C) 93 kg	D) 73 kg
	0	0	0	0

32) In the figure, block A has a mass of 3.00 kg. It rests on a smooth horizontal table and is connected by a very light horizontal string over an ideal pulley to block B, which has a mass of 2.00 kg. When block B is gently released from rest, how long does it take block B to travel 80.0 cm?



33) The figure shows a block of mass *m* resting on a 20° slope. The block has coefficients of friction $\mu_s = 0.64$ and $\mu_k = 0.54$ with the surface of the slope. It is connected using a very light string over an ideal pulley to a hanging block of mass 2.0 kg. The string above the slope pulls parallel to the surface. What is the minimum mass *m* so the system will remain at rest when it is released from rest?



A) 3.6 kg

B) 1.3 kg

C) 2.1 kg

D) 3.3 kg

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

34) Three objects are connected by weightless flexible strings as shown in the figure. The pulley has no appreciable mass or friction, and the string connected to the block on the horizontal bench pulls on it parallel to the bench surface. The coefficients of friction between the bench and the block on it are $\mu_s = 0.66$ and $\mu_k =$

0.325. You observe that this system remains at rest.

- (a) Find the mass of the hanging object A.
- (b) What is the magnitude of the friction force on the block on the bench?



35) Two packages are connected by a very light string that goes over an ideal pulley as shown in the figure. Package A has a mass of 3.0 kg and can slide along a rough plane inclined at 30° above the horizontal. The string acts on package A parallel to the surface of the plane. The coefficient of static friction between package A and the plane is 0.40. What minimum mass should package B have in order to start package A sliding up the ramp?



Answer Key Testname: FORCES AND NL PRACTICE TEST

2) A 3) D 4) D 5) D 6) D 7) A 8) A 9) A 10) D 11) B 12) C 13) C 14) B 15) C 16) B 17) A 18) B 19) C 20) A 21) C 22) A 23) B 24) C 25) C 26) D 27) D 28) D 29) B 30) A 31) B 32) B 33) C 34) (a) 22 kg (b) 270 N 35) 2.5 kg

1) A

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